1578

THE

SCIENTIFIC AND LITERARY REVIEW,

AND RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

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THE INVENTORS' INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE.

Chairman of the Council—**SIR ANTONIO BRADY.**

THE various efforts which have been made, and the numerous influences now at work to injure, if not to destroy, Patent Rights; the inefficiency of the many well intended, but ill considered, schemes of Patent Law Reform which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor, without advantage to the Public; together with the proceedings so essentially involving the interests of inventors which have already taken place in Parliament, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organizing the influence of Inventors, Patentees and others. Its objects are:—

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APPLICATIONS FOR LETTERS PATENT.

*** In this list (Com.) means Invention communicated from abroad.

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On August 18th.—2727 to 2737.—M. Pearson. Looms for weaving narrow fabrics.—J. F. Smyth. Manufacture of gas.—J. W. Freestone and J. Humphris. Process and apparatus for treating spent oxide of iron to extract sulphur and ammoniacal salts therefrom, and for purifying these products, which invention is also applicable for the extraction of grease and oil from seeds and other materials.—W. Brookes. Constructing and supporting and connecting together the rails of railways and tramways (com.)—J. Dean. Fire-places.—J. Lucas and W. Nichols. Machinery and appliances for cutting coal.—J. M. Tall. Construction of concrete walls and buildings and apparatus to be used therein.—J. R. Forster. Elastic spigot and socket pipe joint for gas, water, steam, and liquids.—R. Sim and J. Anderson. Knitting machinery.—W. E. Newton. Apparatus for converting a rectilinear reciprocating motion into a rotary motion (com.)—J. C. Gawler. Coupling of railway carriages.

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(RULES EXTRACTED FROM THE DIRECTORY.)

51. Division III., Recent Scientific Inventions and Discoveries, will consist of objects the excellence and novelty of which are considered by the committee of selection to be so great as to render it undesirable that their introduction to the public should be delayed until the proper year for the exhibition of their classes of manufacture in division II.

52. No objects will be admitted into division III. which have been shown in previous International Exhibitions of this series, unless very important alterations or improvements have been added to them since the date of their previous exhibition.

53. To assist the committee of selection in judging of the qualifications for admission of any invention submitted for exhibition in division III., it is desirable that the form of preliminary application (No. 10) should be accompanied by a statement of the inventor's special claims to novelty and excellence, and (if possible) by the written opinion of some scientific gentleman of repute who has practically examined the invention.

54. The Act of Parliament for the protection of inventions exhibited at the Annual International Exhibitions is entitled "The Protection of Inventions Act, 1870," 33 and 34 Vict. chap. 27, and dated July 14, 1870.

57. The latest day appointed for receiving objects in this division is Wednesday, 11th March, 1874.

7. Applications to submit objects, proposed for exhibition, to the official committees of selection, should be made on the form of preliminary application (No. 10), which can be obtained at the offices, 5, Upper Kensington Gore, London, S.W., and should be forwarded to the secretary before the 1st of January, 1874.

DEATH OF CORNELIUS VARLEY.

We have to record at the great age of nearly 92 years, the death of this scientific veteran, who departed this life on the 2nd Ootober, 1873. He was one of the earliest members of the Inventors' Institute, and many must remember his familiar voice at its meetings, for his knowledge of practical science was so varied, that on almost every subject he had some information to give which was always serviceable to the cause of scientific truth. He was one of a family of five, his elder brother being John Varley, the father of water-colour painting; his younger sister was married to the elder Mulready. His mother's maiden name was Fleetwood, a direct descendant from General Fleetwood, who married Oliver Cromwell's daughter. Having lost his father when he was ten years of age, his uncle, Samuel Varley, took charge of him, and taught him mechanics, optics, and chemistry. In 1794 his uncle and himself began a series of chemical experiments; and eventually Cornelius Varley devised the method of polishing lenses upon a mixture of beeswax and oxide of iron, the method generally employed by opticians at the present day. Cornelius Varley made several improvements in microscopes and lenses, he also made the first diamond microscopic lens; and exhibited it at one of the meetings of the Royal Institution

In the year 1800 he joined his elder brother, John Varley, who taught him to draw from nature, and the Earl of Essex introduced him to his first pupils.

In 1808 he and seven others, among whom was Turner, the painter, formed a sketching society to meet at each other's houses. In 1809 he invented his "graphic telescope," an ingenious and very useful instrument, and Mr. T. Horner purchased three, with which, from the top of St Paul's Cathedral, he traced the panorama of London in true perspective, for the Colosseum in Regent's Park. In 1821 he married Miss E. L. Straker, and had issue, seven sons and three daughters, four sons and three daughters being now living, amongst whom are Mr. Cromwell F. Varley, the well-known electrician, and Mr. F. H. Varley, C E., the chairman of the Ordinary Council, or Executive, of the Inventors' Institute. In 1822, he was offered the governorship of some mines in Brazil. It was an honourable and lucrative position, and of considerable importance to him at the time. A ship was being fitted out for him, his family, and staff, when he discovered that slaves were to be employed in the mines; he at once threw up the appointment in an instant, an action thoroughly characteristic. He was an active co-operator with the Royal Institution in its early days, and delivered the fourth Friday evening lecture there, on the 24th February, 1826. By marriage, he was a family connection of the late Mr. Faraday. He was also one of the founders of the Royal Microscopical Society.

He was an active worker, his recreation being to watch and advance science and art. His memory was wonderful, and brilliant to the last. Few could converse with him without receiving instruction.

Scientific and Literary Review,
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ARTS, INDUSTRY, AND MANUFACTURES,
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JOURNAL OF THE INVENTORS' INSTITUTE.

NOVEMBER 1, 1873.

INVENTION AND ADULTERATION, AND SIMULATION.

To our mind the gift or faculty of invention is the most God-like of all the attributes of man. Creation, in its high sense, is one with invention, which is usually acknowledged to be Divine, notwithstanding all that neoteric philosophers, plagiarising their pagan predecessors of ancient days, may trumpet forth as novel and true in regard to development, evolution, natural selection, and the like.

But high in the order of things as may be the place of invention, yet it seems we must not, when it is possessed by human beings, consider it as exempt from liability to debasement, for experience has shown us that the inventive faculty may be so perversely misapplied as to lend its aid not only to foolish projects, which may prove injurious to the pecuniary welfare of many individuals, but it may even be exercised on behalf of matters which are not only immoral, but legally criminal; such, for instance, as the invention of instruments of burglary, or, what is perhaps more common, invention may afford its aid to the adulterator of our meats and drinks, or the simulator of the Spurious for the Genuine.

Most of us have heard of the Dutch butter, which was said to be made from the filthy mud of the banks of the Thames, and some may perhaps be aware that not long ago, before the very properly stringent laws now in force were enacted, machinery for cutting and shaping chicory into simulated coffee-beans was the subject of a patent application, which, we believe, was, as was only proper—objected to by the Crown law officers as conducing to the carrying on of unlawful practices.

Although we are not inclined to attach the character of baseness to the matter we have now to bring before our readers, yet we feel it our duty to deprecate the application of invention to such matters as that one which has recently received commendatory notice in that well-known and highly respectable journal, the *Scientific American*, which, by-the-bye, although a journal of inventions, has, according to some of its recent utterances, some very unsound notions as to the true basis of property in inventions, which, according to its views, are *evolved by spontaneity* rather than produced by creation. The invention we refer to has, it appears, received practical development, and obtained a certain commercial *status* in the United States of America, although claimed for a Frenchman as originated by him. This "notion" is the scientific production in a regular and systematic way of butter from fats, for though the inventor is said to restrict himself to beef suet, yet we cannot help thinking that what will happen if great commercial success be desiderated by the promoters of this new industry is, that beef suet will not be the only substance operated upon, to obtain the olein which is required, and that in our shops a very definite and prominent distinction between butter from natural milk, and the olein butter from the butter factory, will not be strictly maintained unless our penal laws are found sufficient to deal efficiently with the new traffic—of course, if from considerations of cheapness or otherwise, consumers should prefer the factory-made butter, we don't see who has a right to interfere, seeing that nothing deleterious is introduced into the new article; but the public must be stringently protected against the newly-invented article being passed off as the old-fashioned butter made from our dear old friend—the cow's veritable milk—for it may be safely maintained that the new-fangled article is *not equal* to the old-established favourite.

The above-mentioned journal devotes to this subject a large portion of the space of one of its recent numbers showing—First, that milk is a mechanical mixture of butter, casein, and water, the latter holding in solution sugar of milk, or lactin, and several salts. The butter being held suspended in the milk by the caseous or cheesy matter, and the whey, with which it is intimately blended. That milk is a true emulsion, resulting from a mixture of these three ingredients, and owes its opacity and white colour to the diffusion through it of the butyraceous oil. That particles of butter in milk consist of very minute globules 1-2500th inch in diameter, suspended in the surrounding serous fluid. And after detailing the usual process of butter making, thence proceeds to detail the particulars of the manufacture of artificial butter by a Hashing machine which chops up and grinds washed suet. By steaming vats, and by presses for expressing the olein. And the article concludes with the following remarks favourable to the character of the new butter:—

> We tasted some of the butter thus made and prepared for the market. With the exception of a slight granular consistency, we could perceive no difference between it and good ordinary firkin butter. This peculiarity, it is stated, disappears after keeping for some length of time.
>
> The butter made in this way can be afforded much cheaper than the ordinary article, but it must not be supposed that the cow's occupation is for ever gone. Suet is an article the supply of which is limited, and it is only in large cities, or localities where beef cattle are largely slaughtered, that it will prove profitable to engage in the manufacture of this artificial butter. The company expect, we were told, to enlarge their works to the capacity of some twelve tons of butter per day. This is only about one-tenth the quantity daily consumed in the city of New York.
>
> The butter made can be transported to and will keep in warm climates, owing, as before stated, to the absence of the readily putrescible compounds existing in ordinary butter. Shipments have already been made to South America; and as regards home consumption, it is said that hotels in this city, and even a fashionable club, are customers of the company for this artificial butter.

THE BRITISH ASSOCIATION.

(Concluded from our last.)

SEPTEMBER 18.

ECONOMICAL SECTION.—Mr. Hyde Clarke read a paper on "The Influence of Large Centres of Population on Intellectual Manifestations," which did not attract so much attention as the importance of the subject seemed to demand. Mr. Haughton followed with a paper on "Railway Amalgamation." The discussion on this was very interesting, both Lord Houghton and Mr. Forster taking part in it, the former particularly condemning the State purchase of railways, though he was rather strongly in favour of amalgamation. Some considerable surprise was expressed at the large figures used by Mr. Binns in describing the receipts of Bradford building societies, which seemed to be in a much more flourishing and prosperous condition than is generally known. Much interest was shown in Mr. Hanson's paper on "The Educational Statistics of Bradford," in which he strongly condemned the half-time system, and maintained that the educational results of legislation were by no means commensurate in Bradford with the expenditure. A pitched battle was fought on these points between Mr. Fitch and Mr. Forster on one side, and the writer on the other, the former maintaining that the half-time system, if not desirable in itself, was at least a necessity of the times; while the educational return, large and increasing as it was, gave much cause for satisfaction with the results of recent efforts.

BIOLOGICAL SECTION.—The inaugural address by the President, Dr. Allman, was of considerable interest, though the new ground broken up was not extensive. The discovery of order among a chaos of seemingly disconnected facts is perhaps the highest attainment to which science can make pretensions, and must always precede, as indeed it alone can render possible, that power of predicting future events, which is more striking to the popular mind. The difficulties in the way of the natural classification of the animal kingdom are no fewer nor less important than those in other branches of science, and the lecturer followed at some length the steps by which many of these have been overcome. These steps resolved themselves mainly into two, a study of the anatomy and of the development of animals. By the anatomy it is possible to distinguish between forms, which like some of the protozoa cœlenterata, show no difference from one another appreciable to the naked eye; but this method utterly fails if it be attempted to apply it to an organism which, like the sacculina, has no structure whatever. But where the anatomy proves of no use, development comes to our assistance, for the egg of this animal, if watched, will be found to develope into a creature closely allied to the common barnacle, and its affinities at once become known. On the subject of Darwinism, which also obtained some notice from Professor Phillips in his address to the Geological Section, Dr. Allman made some shrewd observations. Though admitting, at least by implication, the principles on which the theory is based, he remarked that the great difficulty in the way of accepting the system as a complete account of the animal world, is the great and even enormous lapse of time necessary for the required changes to take place. During these intervals the whole existing series of animals might, he showed, become extinguished, and it might so be necessary for the development to start afresh, and what particular direction this might take it would of course be impossible to predict.

Quite an interesting discussion arose on a sudden on Dr. Fothergill's paper "On the Relation between Brain Work and Blood Supply," Dr. Carpenter, Dr. Ferrier, and Dr. Crichton Browne following one another in rapid and animated succession. It is difficult to realise, on the first presentation of the new idea, that complicated mental phenomena and brilliantly imaginative evidences of intellectual power can be resolved into such physical conditions as an increase of blood supply to the brain; yet such is undoubtedly the tendency of modern investigation as exhibited both in the paper of Dr. Fothergill, and in those experiments by Dr. Ferrier, the interesting details of which were presented to the public in the Biological Section.

MECHANICAL SECTION.—Mr. Newton's paper on Tilghman's sand blast process for cutting hard substances was read, and excited much interest.

SEPTEMBER 19.

GEOLOGICAL SECTION.—Dr. Pengelly occasionally animates the dry bones—or should we not in this section say the dry stones?—of science with his overflowing humour. Thus, to illustrate his great familiarity with Kent's Cavern, he told how that the natives around that place were accustomed to say that he walked there every day, a distance of three miles, and that on one occasion, when he was too ill to go, his boots, from the force of habit, started off and went on their own account. No bootless errand either, we should say. But his story in reference to the untold length of geological periods was even better. A good man, with a lingering prejudice in favour of the popular Biblical notion of six thousand years as the age of the world, button-holed the doctor, and implored him to say distinctly whether he really did believe the ages that he talked of to be longer than the orthodox 6,000. He replied that his friend might add to that number as many noughts as his fancy dictated, and even then not to make it *naughty* enough.

Professor Williamson's lecture on coal and the coal plants, well delivered and fairly exhausting the subject as at present understood, brought to a close an interesting and exciting day.

BIOLOGICAL SECTION.—Dr. Rutherford delivered his address to this section. The controversy concerning a Vital Principle is one of old standing, and raged before Bichat defined his view of life as "Organization in Action," but Dr. Carpenter was probably justified in saying that more time than was necessary was spent by Dr. Rutherford in demolishing the already upset notion that the Vital Principle is an entity behind those phenomena which go to make up what we understand by the expression. The substitution, however, of the expression vital force proposed by Dr. Carpenter did not go far to remove the difficulty. As usual, it was more easy to illustrate than to explain a difficulty, and when Dr. Rutherford asked how it happens that a mass of hepatic protoplasm, for example, will secrete bile, while a similar mass in the stomach will produce gastric juice, his question was more felicitious than its answer. The tendency of science in all directions is indeed to displace, or at least to push back step by step, those theories of phenomena which imply some hidden essence or entity behind them. The explanation of the classical and subtle Greek that the to him extraordinary phenomena witnessed in a running stream, a living tree, or a springing fountain, must be found in the God he supposed to animate them, is an idea which has not exactly approved itself to modern science, neither is it disposed to view more favourably a notion which, like the one revived for the time by Dr. Rutherford, evidently belongs to the same category, and would compel it to transcend that region of phenomena which is its only province. Whether science will always confine herself purely to the phenomena, or whether she may not attempt one day a more complete explanation of the universe, or whether she will always have to face the admission that difficulties thrust back are not therefore solved, are some of the general questions of the future which give to that raised by Dr. Rutherford its main if not its only importance. As the time approached for the delivery of Dr. Ferrier's paper—he is not, by the way, any relation, as has been stated, of Christopher North—the lecture hall became more and more crowded, until at last ingress and egress were both alike difficult. The crowd here was even greater than in the Economic Section, though that at some periods of the day was well filled. For various reasons, partly because the human brain was to be discoursed upon, partly because it was thought the popular subject of phrenology was to be referred to, and partly because it had been more than hinted that some new and striking facts were to be made known, the general interest in Dr. Ferrier's paper was greater than in any other subject during the day. Nor, although the lecturer occupied two hours in the delivery of his remarks, did the interest once flag. Describing first the general aspect of a human brain, Dr. Ferrier proceeded to the comparative anatomy, remarking that as the brain is examined in a series of animals it is found, though constructed on the same general principles and having analogous parts, to vary much in the number and complexity of the convolutions and in the development of parts. Referring them to the experiments which were performed in Germany three years ago, in which certain movements were observed to follow on irritation of various parts of the brain, he explained the manner in which his own investigations had been carried out. Much interest was shown as he related how he had been led on from one step to another, until he was able to predict almost infallibly the succession of certain definite movements on irritation of known portions of nervous tissue. From the remarks of the speaker it was inferred that much yet remained to be stated had time permitted. As it was, the interest excited was intense and widespread both among the public and members of the section who have made a special study of physiology. Such results stated on the authority of experiments carefully conducted could not fail to excite an animated discussion between several prominent members of the association, among them Dr. Haley, Dr. Carpenter, Dr. B. Sanderson, Dr. Crichton Brown, and Dr. Brunton, rose one after another.

Mr. Tylor's paper on the Relation of Morality to Religion in Early Stages of Civilization was remarkably able, and the discussion that followed well worth hearing; Mr. Moncur Conway's remark that early races had no devil because their deity served them for an evil spirit as well as a good, being very shrewd, and seeming to excite great attention.

CHEMICAL SCIENCE.—This section met in the Unitarian School-room, Chapel-lane, the president, Professor W. J. Russell, in the chair.

Professor G. C. Foster, F.C.S., read a report on a new pyrometer. He said the report was more properly on Siemen's pyrometer, but this pyrometer was so little known to practical men that it might be called a new one. The action depended on the decrease in the conductivity of a platinum coil when it was heated. When a coil was hot the freedom with which an electric current was transmitted decreased, and by measuring that decrease with an electrometer the temperature was ascertained. The convenience of this pyrometer lay in the ease and accuracy with which that decrease could be measured. He need not point out the importance of those measurements of furnace temperature for which the instrument was chiefly intended. A committee of the association was appointed to examine its applicability to this purpose, and one of the first points examined was whether it always cooled back to the same zero point. It was ascertained that it did not—that every time the heating and cooling down was repeated there was a permanent rise in the zero point. Professor Williamson had found that platinum underwent a change when heated with silica in a reducing atmosphere; this, of course, modified the conducting power of the wire. Mr. Siemens endeavoured to remedy this by surrounding the platinum wire with a platinum tube, an iron tube being placed outside of all. Unfortunately, however, their experiments did not show that this had any particular efficiency in doing away with the defect in question. In their experiments it had been found that a coil whose resistance before heating was 9·938, and at the extreme temperature attained 31·0, when cooled down again showed instead of a resistance of 9·938 one of 10·465, and other trials showed an equal permanent change. Thus there was not that improvement which was hoped for. Nevertheless, although the scientific value of the instrument was not great, it was yet of great practical advantage. The committee hoped, if appointed for another year, to make further researches.

In reply to a question, Professor Foster said that they had not this year experimented on the point as to whether the advance in the zero point was progressive, or whether after a great number of heatings there was a tendency to fixity of the zero point. Last year, however, they noticed some such tendency with a pyrometer which had been heated fifty times.—The President asked what temperature would be indicated by the advance from 9·938 to 10 465, if it were caused by increase of temperature instead of a permanent advance of the zero point. —Professor Foster replied that it was very small indeed.—In answer to other questions, Professor Foster said that he could not say whether one long-continued heating produced the same effect on the zero point as several briefer heatings. The highest temperature employed in the experiments was that of a common fire burning briskly. Experiments made by Professor Williamson had shown that the change in the zero point was due to the alloying of the platinum with silica.—The President observed that the pyrometer must be of great practical use, despite the error which was their difficulty, when in experiments with such high temperatures the error only amounted to some 1·5 degrees.

MECHANICAL SCIENCE.—This section met in the Chuch Institute, under the presidency of Mr. W. H. Barlow.

The president, in opening the proceedings, announced that the president of the Chemical Science Section would take all papers on sewage on Monday, at half-past eleven, and after the section meeting had closed for the day, the Corporation of Bradford would throw open their sewage filtration works at Bolton for inspection.

Mr. F. J. Bramwell, C.E., F.R.S., then read an interesting paper on Huggett's System of Manufacturing Horse-Nails. About seven years ago Messrs. Huggett entered on the manufacture of nails. They applied to Mr. Moser, a well-known iron-merchant. He supplied the capital, and they had now been trying for seven years. For three years a plan had been worked which gave great prospect of success, and produced a nail which to the eye of any but the experienced farrier was perfect, but which possessed certain imperfections which rendered it practically useless. All the expense incurred in erecting this machinery was therefore thrown on the scrap heap. A totally different plan by the same inventor produced a perfect nail. But although the nail was perfect, the machinery knocked itself to pieces, and after two years' trial, this also had to be abandoned. Messrs. Huggett again applied to Mr. Moser, and he, nothing daunted, still persevered in his effort, but determined to fortify himself with a practical opinon, and applied to the author of that paper, Mr. Bramwell. His advice was given, and £5,000 was invested in making another trial. The expenditure proved the advice to have been sound, the process was a commercial success, the nails were as good as the hand-made ones, and the machinery was not injuriously affected. The Swedish nail-rods, which was the only description of iron which ought to be used for the purpose, were first placed in a Siemens' furnace, where they were heated to a high welding heat in thirty seconds. This furnace was, he believed, necessary to the success of manufacture, as it was in the highest degree essential that the iron presented to the rolls should be of uniform size. The waste which took place in the ordinary furnaces not only had the effect of destroying the material, but the efficiency of the machine would be affected by the diminished size of the rods, so that full-shaped nail blanks could not be obtained. The Siemens' furnace, therefore, by its property of heating without oxodising, fulfilled every requirement. The rods thus heated were then thrown into the rolls, which run at 550 revolutions per minute, where they were shot through and were changed from parallel rods of about 2 ft. 6 in. long to rods about 7 ft. long, made up of alternating prominences and thin spaces; each prominence or thick part when finished forming two heads, and each thin part forming two shanks. The prominences on the rods were then flattened by being put edgeways through a pair of rollers. These spread out the prominences and make the necessary projections on the edge and side of the shank to form a head. This was done cold. The rods were then taken to the cutting machine, which at one operation cut the rods through, both for the head and the point, at the same time making the point. The separate nails were then examined and the imperfect ones rejected. They were then annealed, and afterwards "rumbled," or worked together in a revolving cylinder, for seventy-two hours. The nails were then taken to the heading machine, the lower part of which consisted of a wheel capable of revolution containing twelve pairs of dies. The nails were inserted in these dies and then the wheel, making an intermittent revolution of one-twelfth, brought in succession a pair of dies with its nails under the action of a heading tool, resembling the "tup" of a steam hammer, which was brought to bear on the nail by cam action. While this was taking place the two halves of the dies were held together by pressure. After the head had thus been formed, the holding action was taken off, the wheel made another twelfth-part of a revolution, and the headed nail was discharged by the blow of a mechanical hammer. The nails, after being again annealed, were taken to the shaping machine, which was practically similar to the heading machine excepting that it had a pair of side dies as well as an upper and lower die. They then went through another sorting, were rumbled for seventy-two hours with black-pot (powdered crucibles), were again rumbled for seventy-two hours in water only, and finally were blued by being exposed to a gas flame in a revolving cylinder, precisely like a coffee roaster. It was supposed that there were three million horses in Great Britain and Ireland. These required one thousand million nails a year. These were now made by hand at a cost of about 3s. 3d. per thousand for number tens, the standard size. The "applied labour" in producing nails by this process, as it was carried on at present in the suburbs of London, was only ninepence a thousand. The plant at present in use was capable of turning out five tons of these nails per week, and great extensions were contemplated.

Mr. Thos. Webster, Q.C., F.R.S., said the process introduced to their notice by Mr. Bramwell reminded him of the time when wool was combed by hand. Just as that industry was formerly, the making of horse-nails was still carried on under conditions unfavourable to health. He thought that the introduction of machinery for the manufacture of horse-nails would lead to as comparatively great and good results as had followed on the perfection of combing machinery. Mr. W. E. Newton said that it was easy enough to make a horse-nail by machinery, but it was the firm belief of competent authorities that it was an essential that a horse-nail should be forged, and he contended that the nails made by this process were simply cut nails. Machinery for making forged nails was in successful use in America, and an American inventor's machine was now being made at Leeds, and would shortly be finished. In this machine the action closely resembled the process as followed out by hand. Mr. E. H. Carbutt remarked that the perseverance which had been displayed in perfecting this process was worthy of all the success which promised to attend its introduction. Mr. Richardson, of Oldham, made a few remarks as to the value of the Siemens' furnace for small work. Mr. J. A. Huggett said that the idea that a horse-nail must necessarily be forged was exploded, as the nail rods after having been rolled in the manner described in the paper would stand even more bending and twisting than a hand-made nail. He also gave some particulars as to the cost of production. Mr. Bramwell, replying to Mr. Newton's remark, said that these were not cut nails in the sense in which the term "cut nails" was usually understood. It was no more correct to apply this term to them, than it would be to say that an axle was a cut axle because it had been forged and had had its ends cut off. (Applause.)

On September 19th, papers in Sections A, B, C, and G:—

Section A.—Mathematical and Physical Science.—Professor R. Stawell Ball—To Exhibit and describe Dynamometers; Professor Forbes—On Irradiation, on Certain Connections between the Molecular Properties of Metals; Professor Zenger—On the Correlation between Specific Weight and Specific Heat of Chemical Elements; On the Action of Symmetrical Conductors and Lightning Conductors; F. H. Wenham—On the Influence of Temperature on the Elastic Force of Springs; Arthur Schuster—On the Effect of Pressure and Temperature on the Widening of the Lines in the Spectra of Gases; W. G. Davis—On some Abnormal Effects of Binocular Vision; G. M. Whimple—On a New Form of Rutherford's Minimum Thermometer; C. J. Woodward—On a New Form of Oxy-hydrogen Lantern.

Section B.—Chemical Science.—Professor Williamson, F.R.S.—Report of the Committee for Superintending the Monthly Reports of the Progress of Chemistry; Professor G. C. Foster, F.R.S.—Report on a New Pyrometer; W. Chandler Roberts, F.C.S.—Report on the Method of Making Gold Assays, and of stating the results thereof; J. Dewar, F.R.S.E.—Report on High Temperatures; A. Vernon Harcourt, F.R.S., and F. W. Fison, F.C.S.—On a Continuous Process for Purifying Coal Gas, and Obtaining Sulphur and Ammonium Sulphate; C. J. Woodward, F.C.S., B.Sc.—A New Form of Gas Generator; J. Spiller, F.C.S.—An Artificial Magnetite; Dr. Paul and A. D. Cownley, F.C.S—On the Valuation of Commercial Crude Anthracene.

Section C. — Geology. — W. Pengelly, F.R.S.—Ninth Report of the Committee for the Exploration of Kent's Cavern, Torquay; W. Boyd Dawkins, F.R.S.—Report of the Settle Cave Committee; Note on the Rate of the Increase of Stalagmite in the Ingleborough Cave; Dr. Leith Adams—Concluding Report on Maltese Fossil Elephants; W. Boyd Dawkins, F.R.S.—The Relation of the Pleistocene Mammalia to the Glacial Period; Rev. H. W. Crosskey, F.G.S.—Report of the Boulder Committee; W. Gomersall—The Round Boulder Clay Hills of Craven; W. T. Blanford, F.G.S.—On some Evidence of Glacial Action in Tropical India in Palæozoic, or the Oldest Mesozoic Times; J. E. Taylor, F.G.S.—The Occurrence of Elephant Remains in the Basement-bed of the Suffolk Red Crag; Professor Harkness, F.R.S.—On Faults in the Permian Sandstone in the lower portion of the Vale of Eden, Cumberland.

Section G.—Mechanical Science.—Report and Rainfall Committee; Report of Committee on Instruments for measuring the Speed of Ships; James R. Napier, F.R.S.—On Napier's Pressure Logs; Rev. E. L. Berthon—On the Hydrostatic Log; F. J. Bramwell, C.E., F.R.S.—On Huggett's System of Manufacturing Horse Nails; Charles Gott, C.E.—On the Bradford Waterworks; Joseph Wilcock — On the Bowling Ironworks; Thomas Webster, Q.C., F.R.S.—On the Assimilation of the Patent Systems of Great Britain and of the United States. No noticeable discussion ensued on the reading of this paper.

SEPTEMBER 20.

GEOGRAPHICAL SECTION. — Mr. C. R. Markham's paper on "Recent Arctic Explorations" was the centre of attraction, and it was matter for regret that—owing to the fact of Mr. Forster's address being down for the same time—the attendance, though full, was not so great as it would otherwise have been. The writer advocated further Arctic expeditions, maintaining the existence of an open Polar sea, which would not, therefore, be found so dangerous as seemed to be commonly supposed, and pointing out that the cause of the failure of Captain Hall's expedition was chiefly to be referred to want of discipline in the crew and to the fact that it was not under the command of a regular naval officer. A regular Arctic naval station would not, he said, be found more dangerous than any other—there was an abundant supply of fresh meat in the presence of musk oxen, and the advantages of such a station would be very great indeed. A good deal of excitement was manifested when Captain Markham described how he picked up the crew of the *Polaris*, though, from the circumstances of the case, not much information could yet be made public on the subject. In the discussion which followed several prominent members took part, among them Dr. Carpenter, Admiral Ommanney and others.

MATHEMATICAL AND PHYSICAL SECTION.—Professor Clifford's Report of the Committee on Elementary Geometrical Teaching attracted some attention, but the section somehow did not seem to be in the humour for the discussion on it, which soon fell through. It is this fate of the section sometimes to deal with abstruse subjects, information on which is by no means widely distributed, and a number of papers difficult to understand followed one another, on Hyperelliptic Functions, Modular Equations, &c. Mr. Hanlon read a paper on some suggestions toward the formation of extended tables of Logarithms, which he proposed to obtain by getting the pupils in schools throughout the country to work the Logarithms in the form of arithmetical questions. This suggestion was justly handled very severely by all the members who took part in the discussion, the president of the section going so far as to say when he first heard of the idea he supposed it was a joke. It seemed evident that the trouble of verifying such tables, and the cost entailed in obtaining them, would be much greater than the more effectual method of employing experts to do the work.

BIOLOGICAL SECTION.—The only Department in which a meeting took place on Saturday was that of Anatomy and Physiology. Dr. Burdon Sanderson read an interesting paper "On the Electrical Phenomena accompanying the Contraction of the Cup of Venus's Fly-trap." This plant has a peculiar formation of leaf, the two halves of which are jointed on one another at the midrib, and are fringed externally with long hairs. On the application of an irritant the two parts come together, retaining enclosed between them any small body which, like an insect or fly, may chance to be resting on the surface. Dr. Sanderson showed that when this action took place it was accompanied by the exhibition of electric phenomena analogous in their nature to those which occur when nervous and muscular actions are induced in animals, and he thus pointed out a striking confirmation of the universality of the laws which obtain in all organised structures.

GEOLOGICAL SECTION. — On Saturday, there was somewhat of a Slaughter of the Innocents, none of the papers eliciting much general interest. In the afternoon a party of about thirty or forty members, including the president of the section, Mr. Pengelly, and others, went to Settle at the invitation of Mr. John Birkbeck, of that place, to see the Victoria Cave, where important discoveries of bone fossils have lately been made. After an elegant luncheon the party climbed the hill in the midst of a drenching rain, and inspected the cave. Mr. Boyd Dawkins, Mr. Tiddemann and Professor Hughes explained the formation of the strata and the discoveries which had been made; and a lively discussion took place between the two latter gentlemen as to whether the bones which had been found belong to the pre-glacial or post-glacial period. The party afterwards went to inspect the collection of specimens found in the cave, and which are preserved by the care of the Rev. Geo. Style, the head master at Giggleswick Grammar School.

The papers on Sept. 20th, the above included, comprised in A and C sections:—

Section A.—Mathematical and Physical Science. J. W. L. Glaisher—Report of the Committee on Mathematical Tables; Professor Clifford—Report to the Committee on Elementary Geometrical Teaching; W. H. L. Russell—Report on Hyperelliptic Functions; J. W. L. Glaisher—On the introduction of the Decimal Point into Arithmetic; Professor H. J. S. Smith—On Modular Equations; J. W. L. Glaisher—On Propositions in the Theory of Numbers deduced from Elliptic-Transcendant Identities; Professor Ch. Hermite—On the Irrationality of the Base of Hyperbolic Logarithms; J. W. L. Glaisher—On the Negative Minima of the Gamma Function; Professor Cayley—On the Mercator's Projection of a Surface of Revolution; W. Spottiswood—On Triple Tangent Planes; Professor Clifford—On Some Curves of the Fifth Class; S. C. Tisley—A Compound Pendulum Apparatus; Professor Clerk Maxwell—On the Relations of Geometrical Optics to other Branches of Mathematics; On the Final Equilibrium of a System of Moving Molecules; Rev. Henry Wace—On the Calculation of Logarithams; G. O. Hanlon—Some Suggestions towards the Formation of an Extended Table of Logarithms; Professor Harley—On the Theory of Differential Resolvents; On Professor Evan's Method of Solving Cubic and Binomial Equation of all Degrees; Professor Ball—Further Contributions to the Theory of Screws; Geometrical Solution of the Problem of the Impulsive motion of a Body having Three Degrees of Freedom; Professor Clifford—On a Surface of Zero Curvature and Finite Extent; Professor Everett—On the Kinematics of a Rigid Body.

Section C. — Geology. — J. Thomson, F.R.S., report on the Investigation of Carboniferous Corals; J. E. Taylor, F.G.S., the Occurrence of Elephant Remains in the Basement-bed of the Suffolk Red Crag; Professor Harkness, F.R.S., on Faults in the Permian Sandstone in the lower portion of the Vale of the Eden, Cumberland; Professor A. S. Herschel, F.R.A.S., and G. A. Lebour, F.G.S., Notes on some Experiments on the Conducting Power for Heat of certain Rocks; W. Topley, F.G.S., and G. A. Lebour, F.G.S., on the Whin Sill of Northumberland; T. Moffatt, M.D., F.G.S., on Geological Systems and Endemic Diseases.

SEPTEMBER 22.

MATHEMATICAL AND PHYSICAL SCIENCE.—This section met in Horton Lane Schoolroom, at eleven o'clock, the President again in the chair.

Professor Everett read the report of the Committee on Tides, and also of the Committee on Underground Temperature.

Mr. G. J. Symons read the report of the Rainfall Committee.

Mr. Newton explained to the section the action and various applications of the sand-blast process. It was stated in answer to a question which had been asked when the process was before Section G, that the sand-blast could be applied to the removal of the incrustation from the interiors of boilers. Other questions were asked, and some discussion took place.—Professor Reynolds afterwards read a paper on certain phenomena of impact, an explanation being given of the cause of the efficacy of the sand-blast.

Professor Herschel stated the results of some experiments on the conductivity of rocks. The means by which he had endeavoured to get some certain results on this point were the enclosure of a box of heated water in non-conducting material, and in contact with the rock whose conductivity was to be tested. A delicate thermo-electric pill then measures the amount of heat conducted by the stone. Professor Herschel said that results of very great value had not yet been attained with certainty. Amongst other things, however, it had been ascertained that shale had a very low conducting power.

CHEMICAL SCIENCE.—This section again met in the Unitarian School-room, and the proceedings were begun by Dr. Paul, who read a paper, the work of himself and Mr. A. D. Cowley, on the Valuation of Commercial Crude Anthracene.

Mr. J. Norman Lockyer then brought before the section the subject of the elements of the sun. His object was to obtain the assistance of chemists in dealing with the sun and stars.

Mr. R. B. Grantham, C.E., brought up the report of the Committee of the Association on the Treatment and Utilisation of Sewage.

GEOLOGY.—The section opened this morning by the President calling on Mr. L. C. Miall to read his report on the Labyrinthodonts of the Coal Measures.

The first part of the report, dealing with the general structure of the group, was presented. A large number of valuable and important examples of carboniferous labyrinthodonts were exhibited.

This was followed by a short note by W. Horne, on the Occurrence of Fish and Amphibious Remains in the Yoredale Rocks of Wensleydale, drawing attention to a fine collection of fish remains exhibited by the author.

The report on the British Fossil Crustacea was read by Henry Woodward, F.R.S.

A paper on some New Species of Phyllopodous Crustacean, belonging to the Genus Dishyocaris, from the Carboniferous Series, with notes on others already described, was read by H. Woodward; and related to the discovery of some fossil shrimp-like animals in the coal measures. It was shown that certain so-called new forms were only peculiar fossils which had already been described.

Henry Woodward, F.R.S., F.G.S., read a paper on New Facts bearing on the Inquiry concerning Intermediate Forms between Birds and Reptiles, drawing attention to the question—so much discussed of late—of the significance attaching to the relationship of birds to reptiles; and pointed out that, wide as is the gap existing between Aves and Reptila, yet, nevertheless, there is as a whole scarcely greater disparity between some birds and some reptiles than exists between the Chelonia, the Enaliosauria, the Plerosauria, and the Lacertilia.

Mr. H. Hicks, M.D., read a paper on the Arenig and Llandeilo Rocks of St. David's.

Mr. John Hopkinson, F.G.S., read a paper on some Graptolites from the Upper Arenig Rocks of Ramsey Island, St. David's.

A paper was read by Mr. J. Hopkinson on the Occurrence of numerous Graptolites in the Ludlow Beds of Shropshire. It stated that until recently only two species of graptolites were believed to occur in the Ludlow rocks of Shropshire. Another species was added by Dr. Nicholson in 1868. Mr. Hopkinson now described several new species. One or two forms hitherto supposed to be characteristic of one or other divisions of rocks had not been found in them. The author then particularised the new species, which, he said, characterised distinct zones. He concluded by showing that the Ludlow Rocks of Shropshire possessed a rich graptolitic fauna.

Professor Harkness and Mr. Gwyn Jeffreys made a few remarks, to which Mr. Hicks briefly responded.

Mr. J. L. Lobley, F.G.S., read a paper on the British Palæozoic Arcade.

Biology (Department of Anatomy and Physiology) — A paper was read by Dr. George Harley, on the Formation of Renal Calculi (Professor Rutherford, vice-president, in the chair). After showing that a calculus, or concretion, may be formed in any part of the body, he referred especially to those formed on the kidney, dividing them into the organic and inorganic.

A paper on the Diverticulum of the Small Intestines in Man, considered as a Rudimentary Structure, was read by Professor T. A. Struthers.

A paper was read by Mr. E. Ray Lankester, on the Growth of the Ovarian Egg, and the Early Development of the Cephalopod Loligo. A report of it, without the aid of diagrams, would be almost unintelligible.

A paper on the Development of the Armadillo's Teeth was read by Mr. E. Ray Lankester. Its chief interest lay in the determination of the presence of an enamel organ in the fœtal armadillo, although in this, as in other members of the edentata, there is no enamel in the tooth of the adult; and the enamel organ precedes in appearance the organ which forms the ivory of the tooth.

Department of Zoology and Botany — A paper on the Mollusca of the Mediterranean was read by Mr. J. Gwyn Jeffreys.

A paper on a New Insect belonging to the tribe Ephemeridæ, and on some points in the natural history of that family, was read by Mr. R. McLachlan, who said the family of insects known as Ephemeridæ, or May flies, was tolerably familiar to all who took any interest in natural history or piscatorial pursuits. There was a certain amount of romance with which these creatures were invested on account of the shortness of their existence. Though this point was probably rather exaggerated by writers on popular natural history, no doubt some species only existed as perfect insects for about two days. Others had been proved to live for three weeks. It was also remarkable that a final moult was performed after the winged state was assumed. The insects had no great amount of beauty, and the perfect form was of a low type of organisation.

Professor Williamson followed with a paper on Tree-Fern Stems from the Coal Measures.

Department of Anthropology.—This department re-assembled under the presidency of Dr. Beddoe, F.R.S.

Mr. R. Dunn, F.R.C.S., read a paper on Remarks on Ethnic Psychology. He said that the comparative psychology of the typical races of man presented a subject for investigation of great interest to every ethnological inquirer, and to all physiological anthropologists.

On Comparative Chronology and Philology Mr Hyde Clarke laid before the section the results of his later philological researches applied to America, and the question of its population. From the result of observation he proposed the first basis of a comparative chronology of the migrations of men in the prehistoric epochs between the old and new worlds. This resolved the question whether the culture of America is indigenous and aboriginal, for the languages, grammar, mythology, and culture were common to the whole human race.

Economic Science and Statistics — This section was presided over by the Right Hon W. E. Forster, M.P.

Professor Leone Levi read a report on the Metric System, in which he stated that the hopes once entertained of an early attainment of one uniform system of weights, measures, and coins, had been somewhat disappointed by the action of adverse political events, and the tardy concurrence of Her Majesty's Government.

Major-General Sir James Alexander, C.B., read a paper on the Use and Abuse of Peat.

Mechanical Section.—Mr Wm. Firth, of Leeds, read a paper on the Introduction of Working Coal-cutting Machinery in Mines.

Dr. C. Le Neve Foster read a paper on "The Duty of Arrastres in Reducing Gold Ore in Italy." The author gave the result of experiments carried on for three years and a half in treating gold quartz containing eight to twelve dwts per ton, in the Italian Alps, by means of the Mexican arrastres or stone mills. He said that the machines extracted 82 per cent. of the gold contained in the ore in one operation. The machines are modified Mexican arrastres, on a plan invented by Messrs. T. and J. Roberts and Henry Hoskings.

September 23.

Mathematical and Physical Science.—There was a good attendance in this section, which ebbed and flowed as the matters under consideration attracted less or more attention. Mr. Janssen's paper, in French, "On the Application of Photography to Show the Passage of Venus across the Sun's Disc," was important in its bearing on the transit of that planet next year, and was a good summary of what had been done in this direction. Mr. J. Norman Lockyer's two papers "On the Diffraction Grating" and "On the Results of some recent Solar Investigations," were read one after the other. The latter he was unfortunately compelled very much to cut down, but a good deal of interest was displayed, as he stated his belief that he had discovered a means of estimating quantitatively as well as qualitatively the composition of the sun's atmosphere. Sir Walter Elliot created some amusement by his proposal for the creation of a Minister of Science; most persons present, except himself, being seemingly inclined to treat the suggestion jocosely. The papers in this Section were not taken in the order in which they stood in the programme, a course which, however, it is to be accounted for, almost always tends to diminish the interest taken in the proceedings. Mr. Barrett's two papers, "On the Molecular Changes that accompany the Magnetising of Iron, Cobalt, and Nickel," and "On the Relationship of these Magnetic Metals" concluded the work of the day, considerable attention being excited, as he showed how the action of light may be availed of through its magnetic action to effect mechanical work, and how even here the law of the conservation of energy holds good, some alteration being most probably made in the motion of the pendulum when, by its receiving the flash of light at one point in its swing, the conversion of energy is effected.

Geological Section. — Dr. Carpenter's paper "On the Physical Geography of the Caspian Sea in its relation to Geological Inquiry" had to be cut short, to allow of the writer taking the prominent part he did in the Geographical Section. There was a brisk discussion on the paper on the Sub-Wealden Exploration, and that of Mr. Topley "On the Correspondence between some Areas of apparent Upheaval of the Thickening of Subadjacent Beds;" while a discussion of an hour's duration, in the course of which Dr. Woodward and Mr. Gwyn Jeffreys took part, followed Professor Phillips' two papers, but no very satisfactory conclusions were arrived at. Dr. Carpenter's paper "On the Physical Geography of the Caspian Sea" presented some curious and interesting information. A great inland sea, eighty feet below the Black Sea, with no known outlet, or at most one which leads no one knows where, fed by great rivers, and presenting large salt pans; yet whose saline character is diminishing year by year. The Caspian has for long presented several features of interest, not to say mystery, which lost none of their force at the hands of the lecturer. Commander Davis's paper on the scientific voyage of the *Challenger* drew, as might have been expected, a large audience, who listened with great attention to the writer's account of the soundings taken at various points of the course travelled by the ship, and to the general account of the results of the expedition. Dr. Carpenter was again interesting in the discussion that followed, chiefly on the temperature of the deep sea, and on the modes of protecting thermometers at great depths. The old notions of a uniform temperature at great depths had long since disappeared, and it was still a marvel how, with a temperature of 29½ deg., that at many points the whole ocean did not there become converted into a vast bed of ice. Among other curious things, Dr. Carpenter stated his opinion that when the Pacific comes to be explored, it will be found to have a temperature higher than that of any known sea, since there is the smallest channel at Behring's Straits through which the cold water from the Arctic Ocean can find ingress into it, and the water from the Antarctic Ocean, which alone supplies it with cold contents, must become sensibly warmed in its passage through the heated equatorial regions. Mr. G. H. Darwin's "Account of a Portable Globe and of some Maps of the World" was interesting as an ingenious exhibition of a teaching apparatus which could be folded up when it was desired to convey it from place to place, though it was objected to because the angles formed where the triangular separate parts of it came together implied the impossibility of carrying lines along it, and so seriously affected its teaching power.

Biological Section.—In this department some interesting papers were read. In the discussion that followed the paper by Drs. Dewar and MacKendrick, "On the Action of Light on the Retina and other Tissues," Dr. Harley gave an account of the effects he experienced after nine months' confinement in darkness on the account of an affection of the eyes. He became able to see and read when persons admitted to visit him utterly failed to do either, and when on a dark night he opened his shutters the bars of the window appeared to him bright and luminous. Dr. Binz's paper "On the Action of Alcohol," raised a discussion in which Dr. Brunton said he thought the action of alcohol was a progressive paralysis in which the respiratory centres became last affected. The latter gentleman also read a paper on "Cholera," detailing some experiments he had made in search of a remedy, which had not, however, yet attained such results as he hoped still to reach.

Mechanical Science.—The paper of Mr. Eaton "On the Working of Locomotives by Heated Air and Steam," gave an account of some experiments made on the Lancashire and Yorkshire Railway of working locomotives on the new method, from which it appeared a great saving of fuel had been effected, an engine to which the apparatus had been attached consuming only fifty-eight tons of coal, as compared with another not provided with the apparatus which consumed seventy-four tons in doing the same amount of work. The remarks of Professor Reynolds went to show that this effect was gained almost entirely by the prevention of condensation of the steam against the interior of the cylinder by the formation of a film of air inside. An interesting discussion on steam tramways followed Mr. Barlow's paper on this subject, the President of the Section and others taking part in it.

The work in Section B was not above average interest, and was brought to a termination by the reading of Mr. Jessie Louth's paper "On Gas Burners."

The papers for September 23, in the Mathematical and Physical, Chemical, Geological, and Mechanical Sections, including the above-named, comprised:—

James Glaisher, report of Committee on Luminous Meteors; Sir Walter Elliot, report of Committee on Organisation of Science; Professor Everett, report of Committee on Units; Professor Everett, on a Diffraction Spectrum without a Prism; M. Jannsen, on the Application of Photography to Show the Passage of Venus across the Sun's Disc; Professor A. Schafarik, on the Visibility of the Dark Side of the Planet Venus; J. Norman Lockyer, Remarks on the Draper-Rutherford Diffraction Grating; J. Norman Lockyer, Results of some Recent Solar Investigations; Rogers Field, on a new Aneroid Barometer; G. W. Hope, on Eckhold's Omnimeter, a new Surveying Instrument; W. F. Barrett, on the Molecular Changes that Accompany the Magnetisation of Iron, Nickel and Cobalt; W. F. Barratt, on the Relationship of Magnetic Metals, Iron, Nickel, and Cobalt; Dr. Gladstone, to exhibit Photographs of Fluorescent Substances; C. Meldrum, on a Periodicity of Cyclones and Rainfall in Connection with the Sunspot Periodicity; Arturo de Marcoartu, on the Application of Telegraphy to Navigation and Meteorology; Arthur Schuster, on a Curious Phenomenon observed on the top of Snowdon; W. M. Whipple, on the Passage of Squalls across the British Isles; W. S. Davis, on Refraction of Liquid Waves; J. Park Harrison, Lunar Influence on Clouds and Rain; John Neville, on the Axis of Least Moments in a Rectangular Beam; W. Chandler Roberts, F.C.S., on Horn Silver; Dr. A. Schafarik, on the Constitution of some Silicates; Professor Crum-Brown, F.R.S.E., on the Action of Sulphide of Methyl on Bromacetic Acid; Charles Horner, on the Spectra of certain Boric and Phosphoric Acid Blowpipe Beads; Alfred H. Allen, F.C.S., on the Detection of the Adulteration of Tea; Alfred H. Allen, F C.S , on the Action of Sulphuric Acid on Ethylaniline and Dimethylaniline; Alfred H. Allen, F.C.S , Note on Creed Derivatives; Dr. H. E. Armstrong, on Alpha and Beta-Naphthylic Sulphide.

Section C.—Geology.—W. Carpenter, M.D., F.R.S., on the Physical Geography of the Caspian Sea in its Relation to Geological Inquiry; W. Willett and W. Topley, F.G.S., report on the Sub-Wealden Exploration; W. Topley, F.G.S., on the Correspondence between Some Areas of Upheaval and the Thickening of Subjacent Beds; Dr. Bryce, F.G.S., report on Earthquakes in Scotland; Professor J. Phillips, D.C.L., F.R.S., on the Ammonitic Spiral in Reference to the Question of Flotation; on the Ammonitic Sature in Relation to Geological Time; A. Champernowne, on the Discovery of a Species of Starfish in the Devoniah Rocks of South Devon; J. Thomson, F.G.S., on the relation of *Zaphrentis giganteum, Z. cylindricum and Z. Bowerbankii* to the Genus *Cyathophyllum*; Baron Von Richthofen, the Loess and Salt Basins in Northern China; W. Whitaker, B.A., F.G.S., note on the discovery of Thanet Sand on the Northern Outcrop of the London Basin, near Sudbury; Professor Tennant, note on Diamonds.

Section G.—Mechanical Science.—Report of Committee on Treatment and Utilisation of Sewage; Report of Committee on Baggage's Analytical Engine; Report of Committee on Waves and Roughness of Sea near the Shore; W. H. Barlow, jun., on the Lisbon Steam Tramways; W. Cave Thomas, on the Centre-rail Railway; Archibald Veill, on Stone and Wood Dressing Machinery; C. Burgeron, on the St. Gothard Tunnel; John White, on the Form of Channel Steamer; P. le Neve Foster, jun., on the Irrigation of the Casale District; R. Eaton, Further Results on the Working of Locomotives with Heated Air and Steam; Hyde Clarke, on the Direct Railway to India; John Waugh, on the Prevention of Incrustation in Steam Boilers.

SEPTEMBER 24.

SECTION A.—Mathematical and Physical Science.—Dr. J. H. Gladstone, Exhibition of Photographs of Fluorescent Substances; C. Meldrum, on a Periodicity of Cyclones and Rainfall, in Connection with the Sunspot Periodicity; Rogers Field, on a new Aneroid Barometer; G. W. Hope, on Eckhold's Omnimeter, a new Surveying Instrument; Arturo de Marcoartu, on the Application of Telegraphy to Navigation and Meteorology; J. Traill Taylor, note on Leon Vidal's Photo-Polychromy; G. M. Whippole, on the Passage of Squalls across the British Isles; John Neville, on the Axis of Least Moments in a Rectangular Beam; W. S. Davis, on Refraction of Liquid Waves; J. Park Harrison, Lunar Influence on Clouds and Rain; Arthur Schuster, on a Curious Phenomenon Observed on the Top of Snowdon; W. Marsham Adams, to Exhibit the Mensurator, an Instrument for Solving Triangles, Quadratic, and Simple Binomial Equations.

SECTION C.—Geology.—Dr. Bryce, F.G.S., Report on Earthquakes in Scotland; Professor J. Tennant, F.G.S., notes on Diamonds in South Africa; Baron Von Richthofen, the Loess and Salt Basins in Northern China; W. Whittaker, B A., F.G S , note on the Occurrence of Thanet Sand and Crag in the North-West Corner of Suffolk (Sudbury); J. W. Ellis, note on Stump Cross Caverns, at Greenhow, near Pateley Bridge.

CONCLUDING GENERAL MEETING.—This was held in the Mechanics' Institute in the afternoon, and was largely attended, especially by the ladies. Not much science was talked, however, the prevailing sentiment being the distribution of "soft soap," which, it must be acknowledged, was dispensed with lavish impartiality on all, from the hard-working president to the harder worked Press. The programme commenced with the reading by Captain Douglas Galton of the synopsis of grants of money appropriated to scientific purposes by the General Committee. These sums varied in amount from £20 to £150, and made in the aggregate £1,495. The highest amount granted was for the Kent's Cavern Exploration, and the announcement when made was received with applause. Two other grants are worthy of note as being of local interest, viz., that for the exploration of the Victoria Cave at Settle, and the grant for dredging off the coast of Yorkshire. Another item of £50, not included in the above, was voted to the widow of Mr. Askham, who for many years was a faithful and valuable servant in the capacity of clerk to the Association. Contrary to the expectations which, up to the end of last week, were warranted by the circumstances, it would seem from the statement read by Captain Galton that the number of members and associates had received a large acquisition during the last few days, the total number of those who had enrolled their names up to one o'clock being 1,983, and the receipts £2,102. After the reading of these figures, the long list of "votes of thanks" was begun. Amidst a great deal of what was no doubt mere compliment, we think enough may be gleaned to justify the people of Bradford in coming to the conclusion that on the whole the visitors to that town have been satisfied with the reception they have met with in our busy manufacturing community, and that the accommodation provided for the numerous meeting was considered ample. Mr. Ripley's remarks, in moving a vote of thanks to the President, expressed a sentiment which, says the *Bradford Observer*, we are sure will be shared by all those who have come in contact with the members. He hoped that the associations formed during the visit would prove mutually beneficial to the visitors and to the visited. We think, says the same journal, we can answer that a great many of the inhabitants of Bradford will have pleasant recollections, as well as useful ones, of the visit of the British Association, and we trust that those who have come to the town from a distance will go away with similiar feelings towards its inhabitants.

[⁂ We are indebted to the Bradford journal above mentioned for much of the information presented in our notices of this meeting of the British Association]

PATENT LAW REFORM.

H. E. H., a member of the Inventors' Institute, has sent us a very interesting letter on the above subject. As, however, it is very long, and most of his suggestions are similar to those which have already been well ventilated in the SCIENTIFIC AND LITERARY REVIEW, we give only the following:—

"With regard to fees to pay to the Government for patents, I think that 10s. would be quite enough for the first twelve months, and £2 for the second year; and so on, up to the fourteenth year. I think that a difference ought to be made after the first year's fee has been paid between a frivolous invention (toys, &c.) and a valuable invention, a steam engine, for instance. To pay the same fee for a patent on a small toy as for a patent on a marine steam engine is a very unfair charge. If a patentee pays 10s. for the first year, we must add to the above sum the fee of the patent agent, making a total of £2 or more to be paid for the first year. I have no doubt that the authorities and others will question the soundness of the patent charges being made so cheap, as some critics would say that the country would be overstocked with patents, and manufacturers would be seriously injured by the same system; and others might say that in the course of time inventors could not find machines to improve upon, as all would be quite perfection. In answer to this, I must refer these critics to the steam engine and the great number of improvements in the above; also to the numerous improvements that have been, and will be, made in various other motive powers. Electricity and the telegraph, also electro-magnetism—all of these inventions will have numerous improvements made in them in the future; and I could name many other inventions out of countless subjects that could be improved upon. The public will never be tired of buying inventions of each class in great variety, as most people like to have a great number of new patents to choose from."

MESQUITE gum is the name under which a substance obtained from the *Prosopis glandulosa* is known in Texas. Attention has lately been directed to this gum from the fact that it seems to be identical with gum Arabic, and consequently admits of application to many medicinal and technical purposes.

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ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

Chairman of the Council:
SIR ANTONIO BRADY.

NOTICES.—SESSION 1873-4.

The first members' meeting will be held on Thursday, November 13th, when the opening address will be delivered. 8 o'clock p.m.

THURSDAY, NOVEMBER 13TH.—A paper will be read by E. R. Southby, Esq., on "The Economic Use of Gas for Heating and Cooking Purposes," to be followed by discussion. 8 o'clock p.m.

Council meetings to take place at 7 p.m. on each of these evenings.

TO MEMBERS OF COUNCIL.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

A meeting of the Council (ordinary) of the Inventors' Institute was held on the 16th of October, 1873, at the Offices of the SCIENTIFIC AND LITERARY REVIEW, 21, Cockspur-street. Mr. C. G. Carttar, Member of Council, presiding.

After the minutes of the last meeting had been read and confirmed as being correctly entered,

Mr. F. W. Campin, the Secretary, reported that, in accordance with the resolutions passed at two previous meetings of the Council, he had communicated with S. C. Lister, Esq., J. Holden, Esq., and others, with regard to the representation of the Institute at the Bradford meeting of the British Association, and that S. C. Lister, Esq., had kindly consented to act as representative of the Institute thereat; and he had also very handsomely offered to entertain the Chairman of the ordinary Council and the Secretary if they visited Bradford on that occasion, in accordance with the Council's request. The Secretary also stated that although Mr. Webster, Q.C., had read a paper on the Patent Laws at one of the sectional meetings of the Association, no discussion was reported; but a special meeting was held at which Mr. Lister presided (see report in another column). With regard to the Social Science Congress at Norwich, Mr. Evans, C.E., kindly consented to act as representative of the Institute. He likewise stated that it was his melancholy duty to announce the death of Mr. Cornelius Varley, an old and much-respected member of the Institute, well-known as an artist and a man of science, who was the father of Mr. F. H. Varley, C.E., Chairman of the ordinary Council or Executive of the Institute, and Mr. Cromwell F. Varley, the eminent electrician.

After some remarks by the Chairman, eulogising Mr. Varley, and thanking Mr. Lister, it was resolved unanimously—

"That the condolence of this Council be, and is hereby, offered to Mr. F. H. Varley, Chairman of the ordinary Council or Executive of this Institute, and to the other members of the family of the late Mr. Cornelius Varley on his lamented decease, and this Council hereby record their high appreciation of his sterling character as a man, and eminent talent as an inventor and practical man of science, and that a copy of this resolution be remitted to Mr. F. H. Varley."

It was also resolved unanimously—

"That the thanks of this Council are due, and are hereby tendered to C. S. Lister, Esq., for his services in representing the Institute at the last meeting of the British Association held at Bradford, and that a copy of this resolution be transmitted to Mr. Lister by the Secretary."

"That the thanks of this Council are due, and are hereby tendered to D. Evans, Esq., C.E., of the Gas Works, at Norwich, for undertaking to represent the Institute at the Social Science Congress."

"That the Chairman of the Council, Sir A. Brady, or Mr. Hume Williams, the Vice-Chairman of the Council, according as it may be convenient to those gentlemen, be requested to deliver an opening address in the commencement of the ensuing session."

"Also, that the first meeting be held on Thursday, the 20th November."

The various gentlemen who had proposed to read papers before the Institute were ordered to be communicated with, and the prospectus of the Society for the Promotion of Scientific Industry at Manchester was considered, when it was resolved unanimously—

"That this Council solicits a Conference with some one appointed by that Society with the view to ascertain what co-operation could be brought about."

Mr. Carttar specially proposed for election Mr. Marshall Adam.

The usual financial communications from the Treasury Committee were made to the Council, and the following gentlemen admitted as,—were ordered to be placed on the list of,—members, viz., Mr. Edward Lord, as life member, and Messrs. Edward Lord, H. Handyside, J. Nettleford, H. Hand, Coombe, T. B. Sharp, F. S. S. Darby, J. Hill, Dr. D. Mackay.

Monthly Notices.

Deaths of Mr. Cornelius Varley and Sir E. Landseer.—Prominent amongst the events of the month are the deaths of these two men of eminence in the artistic world, the fame of the latter being almost universal, and that of the former very great amongst all who take an interest in scientific progress. He was a member and warm supporter of the Inventors' Institute. We reserve a memoir of him for another page.

Turners' Company and Technical Education.—The prizes of this Company for turnery work were distributed by the Lord Mayor, on the 13th October, at the Mansion House.

Discovery of a Planet.—Dr. Luther, Director of the Bilk Observatory, near Dusseldorf, discovered another small planet on the night of the 27th of September. "This," says the *Athenæum*, "is the first discovery of the kind made this year in Europe, and will probably be reckoned as No. 134 of the list, as nothing further has been heard of the planet seen once only by Dr. Peters on July 29.

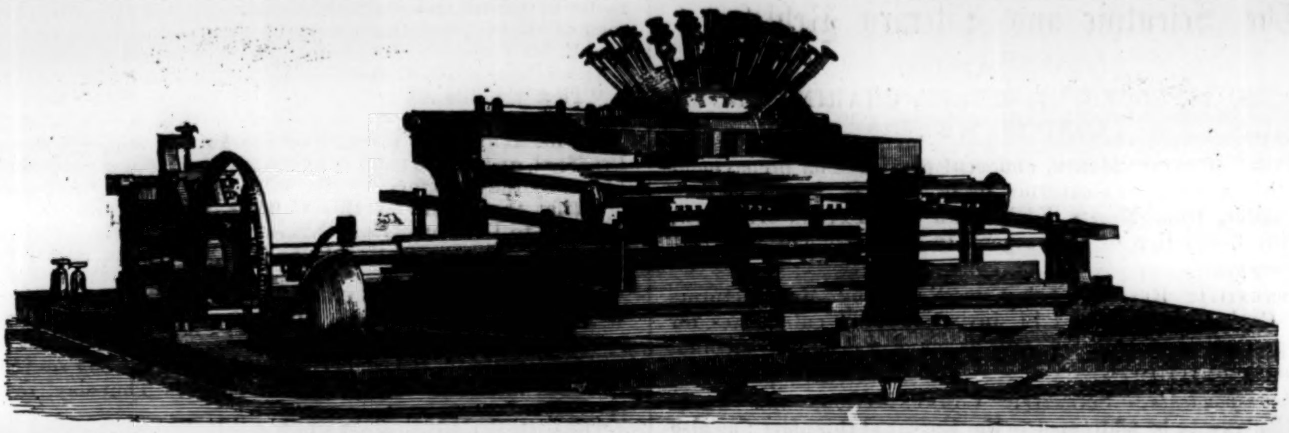
Les Mondes chronicles the death of M. Jean Chacornac, an astronomer of celebrity, born on the 21st of June, 1823, near Lyons, where he died. He was at one time attached to the Paris Observatory, and was the discoverer of six of the large group of Minor Planets, between the years 1853 and 1860.

Sand-blast Process.—At the meeting of the Microscopical Society, on October 1, Mr. F. H. Wenham made some remarks on the microscopical appearance of glass which had passed through the American sand-blast process, showing that the erosion of the surface was entirely due to the percussive force of the particles of sand, and that the results of this were demonstrated by the polariscope. A number of specimens were exhibited in the room.

Prof. Reilly, the Professor of Engineering at the Indian Civil Engineers' College, Cooper's Hill, has in the press a treatise on his branch of science.

Detection of Sewage in Water.—A simple means for this is given in the *Journal* of the Franklin Institute. A half-pint of the water should be placed in a perfectly clean colourless glass bottle; a few grains of the best white sugar should be added to it, and freely exposed to daylight in the window of a warm room. If the water becomes turbid, sewage contamination may be suspected.

Lightning and Lightning Rods.—In the above-mentioned *Journal* for September, Mr. J. M. Mott ends his papers, stating the following as amongst his other conclusions:—"Lightning-rods as usually erected do not afford much protection." "The conducting power of lightning-rods is proportional to their solid contents, and not to their surfaces." "Insulators are of no use in any case." "The rod must be attached directly to the building, the closer the better." "Sharp points for the upper termination of rods are necessary; rods are of but little value without them."



THE WRITING BALL, OR ELECTRIC TYPE-WRITING APPARATUS.

This invention was patented in this country as far back as May, 1870. In October of the same year Professor C. Hotten, the successor of the celebrated Hans Christian Ersted, as Professor of Natural Sciences at the Copenhagen University and Director of the Polytechnic College of that city, gave a description of it in the *Copenhagen Illustrated Paper*, after which it was introduced to a larger public in an article in the Leipzig periodical, *Annalen der Typographie*.

Although this apparatus is termed a writing ball, it is not because it is a ball *simpliciter*, but because the ball part of the apparatus is in reality the pith of the invention. To attain the rapidity aimed at, the letters must be impressed or made visible in some way on the paper by as simple a motion of the hand or finger as possible; the simple depression of a type placed under the immediate and ready control of the end of the finger against the paper will do this. In the ball part of the writing ball there are therefore a certain number of pistons, placed as radii to the ball, carrying type on the lower end converging to a one common centre; on the upper end, convenient knobs for depressing them. These pistons, depressed or struck down against a paper placed in the plane of the common centre would thus make their mark one after the other in the same spot, and to attain a legible production we therefore want an inking process and a forward motion of the paper. The former is obtained through the use of carbon or manifold paper, which by preference is only coloured on one side, so as not to cause the type to get unnecessarily clogged, the latter is accomplished in the following manner:—The paper is placed and fixed on a flat slate or table, the surface of which lies in the plane of the common centre for the above described type-carrying pistons; this table rests on four wheels on to two rails supported by a movable framework, and to provide for the double motion of this slate or table it is fitted on its lower side with a rack gearing into a spur wheel, mounted on a spindle on which it moves longitudinally (held in its position transversely by means of a pin moving in a groove in the spindle), the spindle being rotarily moved by means of a clock-spring actuated by a tooth wheel at each depression of one of the type-carrying pistons is arrested by an escapement in connection with the armature of an electro-magnet, and released as soon as the finger releases the piston, thus allowing the slate on which the paper is fixed to remain stationary while it receives the impression of the type; and moving it a step (the distance necessary between each two letters) forward ready to receive the impression of the next letter; proceeding towards the end of the line in this manner, when the slate is pushed back to its original position. But on its lower side is likewise fitted a steel tooth gearing into a fixed ruchet pole, which in its returning motion it grips, and is thus at once moved the same distance forward longitudinally on the spindle as the teeth on this ruchet are apart, or in other words, on to the starting point for the next line. The electrical connection between the pistons in the ball part and the escapement above referred to is accomplished in the following manner:—The ball, or half sphere, has a semi-spherical cover, which rests on the ball by insulating pieces of ebonite; springs or contact pieces are attached to this cover, so as to establish connection with one pole of the electric battery when one of the pistons is depressed, the other pole being in connection with the solid casting forming the lower part of the ball in which the concentric pistons are moving. To provide the spacing between the words, or between each two letters to emphasise any word, one of the pistons is cut shorter at the lower end than the rest, to prevent its touching the paper, the depression of this therefore causing the same forward motion of the paper as any of the other pistons, but leaving no impression on the paper. A bell shown is used which serves to indicate to the writer when the line is completed; it is struck by means of a small hammer, actuated by a pin on the escapement wheel, and can be set to strike at any point of the complete line, thus enabling the writer to have the indication at the proper time for whatever size of paper he may be using.

The whole construction of the apparatus is simple and to the purpose, the spherical form of the ball part corresponding well with the natural position of the hands. It can be worked very quickly, the rate of speed of course depending in a great measure on the operator. The usual speed obtained is ten letters per second, which is about three times as quick as ordinary writing.

Through the use of manifold paper for the inking process, several copies may be taken at one operation. We have seen as many as ten copies taken in this way.

Apart from the ordinary uses to which the writing ball may be put, as already noticed, there are many others of rarer but of no less important a character. For instance, a person deprived by nature or accident of his hands and arms could still write his own letters with clearness and despatch. By a very simple arrangement a small hammer could be affixed to the stumps, and the pistons of the ball be struck down with this hammer instead of the fingers.

Again, we all know how difficult a matter it is to teach the blind to write, and that even after this has been accomplished a greater difficulty remains, for it is impossible for the blind writer to read what he has written. By the use of the writing ball, however, this difficulty is obviated. On the lower end of the pistons, instead of the ordinary Roman letters, are, for this purpose, engraved those characters which have been found by experience to present an outline best calculated to be read by means of the touch of the fingers.

Upon the movable writing slate or table above referred to is placed a bed or pad of some soft material—blotting paper will answer the purpose. On this pad the writing paper is placed, and the instrument manipulated in the same manner as described for ordinary writing, when, instead of letters in colour, the blind alphabet in relief will be produced.

It will also be evident that the writing ball is remarkably suitable for the use of secret or Eastern alphabets, as the ordinary letters can be engraved on the top knobs, while the type are engraved with the corresponding letter in the secret alphabet, or in any alphabet not known to the operator.

THE PATENT LAWS.

MEETING IN BRADFORD.

On the 24th ult., a meeting of gentlemen interested in promoting certain reforms in the law respecting patents, took place in the rooms of the Bradford Chamber of Commerce. Mr. S. C. Lister was called to the chair.

Mr. Thomas Webster, Q.C., in opening the meeting, explained that during the recent Exhibition at Vienna an international conference had been held with a view to the consideration of the English and foreign patent laws. The circumstances which led to it were that the Americans suggested that the question should be taken up, and the conference was formed of distinguished persons representing all countries. They were assembled on one occasion to the number of 150, and voted in numbers of 70, 80, and 90. A general wish was expressed that the rights of inventors should be protected, and many of them were in favour of an international patent system. When the matter came to be discussed it was thought desirable that the various systems should be assimilated as soon as possible, leaving the administration of them to different nationalities themselves. He proceeded to detail at considerable length the difference between the English and American patent systems, pointing out certain objections to the latter, and said that the principles of the two countries were identical and the practice very much less different than at first sight appeared. He stated that by the Act of 1852 the Caveat system in this country was abolished. That was a system which gave a period of probation and trial during the perfecting of the invention. The provisional specification now in operation had the same object as the Caveat system, which was still in operation in America. The next difference was that they had in America a system of re-issue which was practically the same as our amendment and alteration. He should recommend that the English system should be adopted. Another difference was in the examination system. In America they had a system of examination which was more or less defective, and the result was that, instead of only one-half, about one-fifth of the patents were refused. The remaining difference was the periodical payment system. In England patents were granted for a period of from seven to fourteen years, subject to a payment of £50 at the end of the third year, and £100 at the end of the seventh year. From this revenue there was a surplus of about £80,000 per year, and it would be for them to consider what proportion of that ought to be applied to industrial purposes and museums in different localities, whereby they might have the industries or trade of a town shown in a museum for the education of the people, or otherwise the inventors ought not to be charged the sums that they were. The speaker pointed out that after patents had been entered, about one-third died from natural causes, or were abandoned for want of novelty or utility, and if a system of examination was established he believed they would not have more than one-fourth of the patents granted. At Vienna there was considerable unanimity on the subject of compulsory licenses, and a resolution was carried in favour of compulsory licenses, but this was fenced round with the condition that if public interest should require it, the inventor should allow the use of his invention to suitable applicants upon adequate compensation being made. The last resolution passed at Vienna was that the members of the different nationalities should form sub-committees in their various countries, with power to add to their number, for the purpose of carrying out the aims of the conference.

Mr. F. J. Bramwell wished to make a few remarks on various points raised. First as to the extension of a patent beyond fourteen years, he did not know what had been proposed, but he thought it most important that there should be a power of prolonging them beyond fourteen years. He next referred to what he considered were certain anomalies in the state of the law, or the manner in which it was laid down by the authorities. There was one thing that struck him as particularly absurd. It was the practice of the Privy Council that if a foreign inventor, having got a patent in England, and at the same time had taken a patent in France, found that there was not sufficient trade in Fance, and suffered the patent to lapse, they would refuse him a renewal of the patent in England, when if he had not taken a patent in France they would have allowed it. It was alleged that it was unfair to put Englishmen to an expense which Frenchmen would not have to pay.

Mr. Webster said the Privy Council had felt ashamed of themselves.

Mr. Bramwell also thought it desirable to have the provisional specification on the payment of £5, which would allow a person six months to determine whether he would go on with his patent, and whether it was likely to be useful. He next referred to a decision of the Lord Chancellor, three or four years ago, that if two men had got a similar invention, and the second man obtained the seals to his patent before the first, notwithstanding that the latter had not had six months for preliminary examintion, the six months plan had been found to succeed so well that one-third of the applicants proceed no further, and at the expiration of three years, as they knew, a large number of patents were allowed to drop. He thought the compulsory license question was a hard one to swallow, and he called the attention to the fact, that as the law was laid down at the present time the Government was not bound by any patent, but such inventions as were useful in the construction of ships and manufacture of arms and ordnance could be used, notwithstanding the rights of the inventor. That seemed to him to be a most improper thing to do. The Government ought to be as much compelled to pay as any private manufacturer. (Hear, hear.)

Mr. Jas. Oldham said he had suggested, in one of the sections of the British Association, that there should be an appointment of a Minister of Science, who might be paid out of the £80,000, per year derived from patents. He thought this would be a legitimate means of spending a portion of the money. (Applause.)

The Chairman, who said he attended as the representative of the Inventors' Institute, said they might have patents as cheap as they could get them, but he objected to have commissioners to see whether a patent was good or bad. He thought they should only be required to judge of the novelty of a patent, and then he knew very well they could make a mistake, as they knew how difficult a thing it was to prove whether a thing was new or old. With reference to compulsory licenses, Mr. Webster and he had had some strong battles, but he thought he (the Chairman) had been so far convinced that he thought it was a point that inventors should yield to the general feeling of their opponents, but compulsory licenses must be edged in with the greatest care. The Chairman went on to speak of the litigations which he had had on various points.

Mr. Webster said that in some foreign countries a patent was bound to be put into use in the course of eighteen months or two years.

Mr. R. S. Newall, of Gateshead, said that since he had first taken a patent—about twenty-five years ago—he had taken a great interest in the Patent Law. He pointed out that if compulsory licenses were granted, the patent right would not be absolute in the inventor. He proceeded to read a sketch of a proposed new patent bill which he compiled in 1848. His suggestions were that a patent should be granted for a term of five years subject to a payment of £50, the term to be extended up to twenty years by five years at a time, and a payment of £50 at each period.

Mr. Webster said that personally he knew that the Act of 1852 had endeavoured to deal with the grievances contained in Mr. Newall's pamphlet. After some further discussion,

Mr. Young, of Glasgow, moved that the president of the Bradford Chamber of Commerce be requested to convene a meeting to consider the proper proportions of the surplus received from the money to be paid to the commissioners used for the purpose of establishing industrial museums, and to appoint a committee for that purpose.

Mr. J. R. Napier, of Glasgow, seconded the resolution, which was carried.

Mr. R. S. Newall next moved that the president of the Bradford Chamber of Commerce be requested to call a meeting to discuss the recommendations of the committees of the House of Commons of 1871 and 1872 on the Patent Laws, and report to the London Committee of the Vienna Congress.

Mr. Oldham seconded the motion, and on it being carried, the meeting separated.

ZOOLOGICAL SOCIETY OF LONDON.

The first scientific meeting of this society for the session 1873-74 will take place at the society's house, No. 11, Hanover-square, W., on Tuesday, the 4th of November at half-past eight o'clock, p.m., when the following communications will be made:—1. The Secretary—Report on the additions to the society's menagerie. 2. Mr. J. Beswick Perrin—On the myology of the *Opisthocomus cristatus*. (Received 17th June, 1873.) 3. Mr. Montagu R. Butler—Description of several new species of Diurnal Lepidoptera. Communicated by Mr. A. G. Butler. (Received 1st July, 1873.)

The following communications also have been received:—1. Mr. Robert Swinhoe, H.B.M. Consul, Chefoo—On the Song Jay of Northern China, with further notes on Chinese ornithology. (Received 30th July, 1873.) 2. Mr. R. B. N. Walker, C.M.Z.S.—Letter from, respecting endeavours to send a living Gorilla to the Society. (Received 30th July, 1873.) 3. Mr. Sclater—Characters of new species of Birds discovered in New Guinea by Sig. D'Albertis. (Received 1st August, 1873.) 4. Mr. J. V. Barboza du Bocage, F.M.Z.S.—Observations sur le Bucorax del Afrique australe, *Buceros carunculatus cafer Schley.* Received 4th August, 1873.) 5. Surgeon-Major Francis Day, F.Z.S.—On some new or little known Fishes of India (Received 5th August, 1873.) 6. Capt. R. Beavan, Bengal Staff Corps, C.M.Z.S.—List of fish collected from the river Nerbudda, Nunar District, Central Provinces, India, March and April, 1873. (Received 19th August, 1873.) 7. Capt. R. Beavan—Notes on some facts bearing upon the Darwinian theories. (Received 19th August, 1873.) 8. Mr. J. V. Barboza du Bocage, F.M.Z.S.—Note sur l'habitat de l'*Euprepes coctei*. (Received 3rd September, 1873.) 9. Mr. R. Bowdler Sharpe, F.Z.S.—On a collection of birds from Mombar in Eastern Africa (Received 9th September, 1873.) 10. Mr. R. Bowdler Sharpe, F.Z.S.—On a collection of birds from the river Congo. (Received 9th September, 1873.) 11. Mr. G. B. Sowerby, Jun.—Description of eleven new species of Shells. (Received 15th September, 1873.) 12 Dr. J. E. Gray, F.R.S.—On the skulls and alveolar surfaces of Land Tortoises—*Testudinata*. (Received 15th September, 1873.) 13. Dr. Edward L. Moss, F.R.C.S.I.—Description of a Vergularian Actinozoon from Barrand's Inlet, British Columbia. (Received 25th September, 1873.) 14. Dr. O. Finsch, C.M.Z.S.—On *Lamprolia Victoriae*. A most remarkable new Passerine bird from the Feejee Islands. (Received 25th September, 1873.) 15. Mr. W. S. Atkinson, M.A.—Descriptions of two new species of Butterflies from the Andaman Islands (Received 29th September, 1873.) 16. Dr. T. Spencer Cobbold—Notes on Entozoa, Part 1. (Received 8th October, 1873.) 17. Mr. Edwin Ward, F.Z.S.—Description of a new Bird of Paradise of the genus *Epimachus*. (Received 13th October, 1873.) 18. Surgeon-Major Francis Day, F.Z.S.—On Dr. Buchanan's Fishes of Bengal. (Received 14th October, 1873.) 19. Dr. James Hector, C.M.Z.S.—On *Cnemiornis calcitrans*, showing its affinity to the Natatores. (Received 16th October, 1873.)

BRAY'S TRAM CLEANER.

THIS apparatus is adapted to be fitted to tram cars, and by its adoption, as the cars progress, the trams or rails of tramways may be cleaned or cleared of snow, ice, dust, or other objectionable accretions of matter. One end of a lever is secured to a bar extended and secured from one axle-box to the other, or to one axle-box only; as by this arrangement the cleaner, or clearer, may be kept working at the same distance from the tram as the centre of the wheel maintains; and the other end of this lever is provided with an instrument similar to a plough, which may terminate in a steel tool or cutter, or in some cases may have steel brushes attached thereto to brush off dust from the tram or rail, such plough, &c., working close to the periphery of a car wheel. A spring, secured to the lever, acts between it and the under part of the carriage. The above-mentioned arrangement will be applicable to a single wheel; but if it be desired to render the apparatus useful for either one wheel or the other, the upper end of the lever and of the spring are secured to a block, bolted to the bar, free to turn; so that the whole apparatus can be turned round from the periphery of one wheel to that of the other. To regulate the working of the apparatus, a guide bar is used, which is secured to the under side of the carriage. By means of a foot lever arrangement, the clearer can be raised from the tram or rail when desired. Or instead of the foot lever arrangements a system of chains or pulleysmay be used for effecting the same object.

Reviews.

Rays of Light. A Pamphlet. By F. Ayckbourn. Printed and Published by Joseph Bruton, at 12, Crane-court, Fleet-street, E.C.

This is a very interesting little work, selling for one penny, containing some very sensible remarks on matters connected with inventors and inventions. Perhaps the following, which refers to a department of invention often made a *cheval de battaile* by the Anti-Patent Law party, is as good as anything in the book :—

LITTLE INVENTIONS.

It is, perhaps, difficult to select an article of less pretension to head our list of "Little Inventions" than the old tinder-box, for which, by-the-bye, we never heard that any of our ancestors claimed any special credit as inventor and patentee, or that its prime discoverer was ever heard of. It consisted of a round tin box about the size of a muffin, with a tin lid dropped loosely inside. Some burnt rag or tinder was placed in the box, and the operation of lighting was effected by means of a clumsy piece of steel held in one hand over the tinder, whilst the other hand held a flint stone which, on being struck forcibly against the steel, was expected to elicit a spark, and that spark, if carefully blown on the tinder, communicated sufficient heat to set light to a brimstone match. These phosphorous matches were first sold by Watts, a chemist, near Charing Cross, at a shilling the bottle, together with some thirty or forty prepared matches, which on being dipped in the bottle and withdrawn produced a light. But see what we have now in common use everywhere! Matches, which for the price of one of those bottles of Watts' we can buy enough to last an ordinary family for two years. From this little invention innumerable large factories have sprung into existence, and thousands of operatives are constantly employed both in this country and abroad, involving the wholesome circulation of an enormous capital.

The Story of the Earth and Man. By J. W. Dawson, LL.D. Hodder and Stoughton.

This is a pleasing book on the subject which is now, perhaps, more popular than others within the range of scientific speculation. The opposing theories of man's origin are strongly put, and Dr. Dawson makes out a good case against the evolutionists, and supports a theory agreeing with the teachings of the Book of Genesis. He is, in fact, anxious to consider man "as a son of God," and "not a descendant of Miocene Apes, scourged into reason and humanity by the struggle for existence in the Glacial period."

Quantitative Chemical Analysis. By T. E. Thorpe, Ph.D., F.R.S.E., Professor of Chemistry, Andersonian Institution, Glasgow. London: Longmans, Green, and Co. 1873.

The qualifications of a successful teacher of science must, amongst others, be that he imparts the correct view of the science taught, and also that he will, so to speak, popularize his subject without deteriorating from correct teaching, and thus hold the attention of the student, as otherwise it will be found that the students will not have gained the amount of knowledge which is desiderated; and this is especially true with respect to a work on science written for the use of beginners, as, if the work be dry in manner and style, and contain much mathematical technicality, very few students will be found to reap any benefit from it. On the other hand, however, if it be pleasant reading, and the author avoid so far as possible all such technicalities, it will be a work much sought after.

These we have found to be, generally speaking, the views adopted by the authors of this excellent series of works on science, of which that now under notice forms one. Dr. Thorpe is a writer who has been known for some time as an authority in chemistry, and this work will serve to enhance the reputation he has already obtained. The author states his aim to be to teach the principles of Quantitative Chemical Analysis by the aid of examples chosen partly on account of their practical utility, and partly as affording illustration of the more important quantitative separations, and we think that the aim has been well attained. The work is divided into five parts, namely:—principles of quantitative analysis, simple gravimetric analysis, simple volumetric analysis of solids and liquids, general analysis involving gravimetric and volumetric processes and organic analysis, such parts being subdivided into chapters.

To all interested in the science of chemistry we recommend this work, but especially to the student, to whom it will be found of great service.

The Darwinian Theory and the Law of the Migration of Organisms. Translated from the German of Moritz Wagner, Honorary Professor at the Ludwig Maximilian University of Munich, and Member Extraordinary of the Royal Bavarian Academy of Sciences. By James L. Laird, Assistant-conservator of Forests, Panjab. London: Edward Stanford, 6 and 7, Charing Cross, S.W., 1873.

All adherents of the Darwinian theory will find this a very interesting and instructive production. As it is a pamphlet under 79 pages in length, it is unnecessary for us to say any more about it.

A Handbook of Sewage Utilization. By Ulick Ralph Burke, M.A., Barrister-at-Law. Second edition, revised and enlarged. London: E. and F. N. Spon, 48, Charing-cross.

This is a second edition of a very useful work, for it does just what all interested in the sewage question want done,—it places before them a succicnt, and withal impartial, statement of the nature and effects, as far as can be ascertained, of the various plans of dealing with the sewage of our towns. In this new edition Mr. Burke has been enabled to add a considerable amount of new matter, and to modify in some instances remarks made in reference to certain systems.

Mr. Burke treats the subject under several heads—1, Nature of the Evil; 2, Remedies; 3, Chemical Treatment; 4, Filtration; 5, Irrigation; under which head he discusses the question of noxiousness or non-noxiousness of sewage irrigation in regard to cattle food, from which we extract the following remarks :—

It must be well known to everyone who is interested in the utilization of sewage, that the ammonia contained in it constitutes its most valuable manurial quality, and we have already seen how the various systems of chemical precipitation have failed to secure the volatile substance; and it becomes a question, in considering the advantage of the irrigation system, to see how far this ammonia is liable to be wasted by the conveyance of the liquid sewage in *open* conduits; a mode of distribution which must of course greatly diminish the expense and increase the practicability of all irrigation operations. The experiments have been most satisfactory, and show that while in twenty-four hours the loss of ammonia is scarcely appreciable, after three days the proportional loss amounts to little over thirteen per cent. Another extremely satisfactory fact connected with this loss of ammonia is that when sewage becomes putrid the ammonia which it contains is diminished in quantity, so it becomes the interest of the farmer as well as the public to apply the sewage before it becomes offensive.

The disposal of sewage by means of irrigation is as old as it is simple and natural. As early as the year 1561 there was a sewage farm near Edinburgh, and the irrigation of the celebrated Craigentinny meadows was begun before the year 1760. The sewage of Edinburgh is still applied to these meadows with great success and profit, and those who desire a full and detailed account of the works and operations generally, will find a very interesting account by Mr. McPherson, engineer to the city of Edinburgh, quoted in the *Tottenham Report*, pp. 72-80; 3 S. U. C., p. 198; and 1 R. P. C., p. 74. There appears to be a great waste of sewage, owing to the insufficient area of the land under treatment, and many improvements might be made in the formation of the channels, yet the success of the works in a sanitary point of view is most encouraging, and the profits derived from the crops almost incredible; the crops of rye-grass fetching from £25 to £36 per acre. The lower end of the Craigentinny estate was simply sea-shore, until the sewage was applied to it; it is now as fertile as the rest of the farm, getting richer and richer every year, notwithstanding the enormous crop annually taken off it.

The two most successful sewage farms in the South of England are Norwood and Croydon, the clay land at the former place appearing to be equally successful in purifying the sewage as the light porous soil of Croydon. As to the value of differently constituted soils, see 1 R. P. C., pp. 65-70. It must always be borne in mind that the plant or vegetation has infinitely more to do with the purification of the sewage than the nature of the soil itself. As to the relative success of the works at Croydon and Norwood, see *Tott. Report*, pp. 80-90, and 1 R. P. C., pp. 85-87.

As to Barking, where a farm of about 220 acres has been laid out by the Metropolitan Sewage Reclamation Company, under Mr. Martain, see *Tott. Rep.* 90, and 1 R. P. C., 76. The land was cropped with early carrots, onions, parsnips, potatoes, and mangold, as well as rye-grass, and the agricultural result appears to have been most satisfactory, the value of the crops in some instances reaching £38 per acre. At Aldershot, again, the best cabbages that come into the London market are said to be grown on the sewage farm. [*Tott Rep.*, 93, and 1 R. P. C., 77.]

But perhaps the irrigation system has been carried out with the greatest success at Croydon. The soil and "lie of the land" are most favourable for the adoption of the system, and while citing Beddington meadows as an example of the advantages of the irrigation process, it is not to be supposed that the results could be quite so favourable in every locality, though an examination of the comparative table 1 R. P. C., 94, 95, will show that in many other places the results have been nearly as satisfactory. The soil of Beddington is open, on a gravelly subsoil, with just sufficient slope to render easy the distribution of the liquid sewage over and through it, and there is just sufficient fall between the top and bottom of the farm to allow the tail-water of the upper fields to be spread a second time over the fields below before it drains finally away. The works now in the hands of the local authorities were planned by Mr. Baldwin Latham.

The results of an extensive series of experiments on the manufacture of iron, made at the Government smelting works in 1871, are recently published in the *Zeitschrift für das Berg-Huetten, und Salinen-wesen in dem Preussichen Staate*. These are well worthy the attention of all who are concerned in economizing fuel in the production of pig-iron.

Correspondence.

PHRENOLOGY.

To the Editor of the Scientific and Literary Review.

Sir,—As the paper read by Professor Ferrier at the late meeting of the British Association, Bradford, concerning the functions of the brain, has elicited remarks derogatory to phrenology from more than one quarter, I hope, in the interest of "fair play," you will permit one interested in the cause of phrenology to publish, through your medium, a few words concerning these remarks. This favour is solicited more especially as phrenology, from its discovery to the present time, has been a subject of much interest to many minds disposed to enquiry.

It has been observed in a "leader" of the *Times*, Sept. 24th, that "twenty-five or thirty years ago phrenology was taken up by that large class of people who feel a lively interest in what they conceive to be science, but whose minds have never undergone the training necessary to enable them to understand the nature of proof, or to estimate the value of evidence." Here it is presumed that phrenology is something too gross to be appreciated but by those of untutored minds. But, contrary to this, we have Dr. Richard Whately, late Archbishop of Dublin, who as a logician stood among the first, giving it as his opinion that the metaphysics of phrenology are far more logical, accurate, and convenient than those of Locke, Stewart, Brown, and other writers of their school. Again, Mr. Abernethy, one of the highest medical authorities of his time, both believed and taught the doctrines of phrenology, and lectured on them to the Court of Assistants of the College of Surgeons of London. And in reference to the psychological classification by Gall and Spurzheim, Dr. Laycock, F.R.S.E., says, "I am inclined to adopt that classification as the best arrangement that could be adopted until our physiological analysis of mental phenomena has had a more scientific development." And Dr. Noble, M.R.C.S., says, "The harmony, indeed, of Gall's physiology with everything that is known of cerebral anatomy is so striking, that no one who examines this subject (free from bias) can fail to recognise it at once. It is really most unfair that Gall and Spurzheim should be so slightly passed over as they are in many modern anatomical works. This proceeding, indeed, has been the besetting sin of anti-phrenological anatomists, from Riel downwards. There have been a few honourable exceptions; but more generally the anatomy has been appropriated without any open or distinct acknowledgment." Without referring to other authorities on this subject, these are quite sufficient to make it plain that the article referred to was from one biased or perfectly heedless about "proof, or the value of evidence." Mention is also made of Lord Jeffrey having for a time extinguished the pretensions of phrenology in an article published in the *Edinburgh Review*, in 1826, in which he not only showed that the supposed faculties of the phrenologists had no separate existence, but also that they were not numerous enough for the requirements of life. If phrenologists had proclaimed that those of the mental faculties of which they knew, were the entire of which the mind consisted, then perhaps his lordship would have been justified in denouncing phrenology. But the intimate connection of the faculties one with another (which is explained by the fibrous nature of the brain, and consisting of so many lines of communication between the organs) and their power of co-operation, would sufficiently account for so many characteristics arising out of so few special faculties.

When Professor Ferrier had concluded his address on the localisation of the functions of the brain, Dr. Carpenter was the first to congratulate him on the success of his experiments, which, he said, tended to shew that the real seat of the intellectual functions was at the posterior part of the brain, a view he had long since entertained. It was observed, however, in the article referred to above, that it is probable that Dr. Carpenter's view of the functions of the cerebral hemispheres will have to be modified or abandoned. And it is some consolation to find Dr. Carpenter, in a letter to the *Times* (Sept. 27), acknowledging the justness of this remark so far as it concerns the view he entertained that the cerebral hemispheres as the organs of thought "do not act in isolated portions, but as a whole." Perhaps the next concession that the experiments of Professor Ferrier may extort from Dr. Carpenter may be in the form of an acknowledgment of the untenableness of the position he holds in opposition to the doctrines of phrenology by maintaining that the intellectual functions have their seat at the posterior part of the brain.

It was observed by Dr. Crichton Browne that Professor Ferrier located the memory of words in the very part indicated by the phrenologists as the organ of language. Since this much has been accomplished we may well hope for more. While the experiments of Professor Ferrier serve to demonstrate that particular parts of the brain have special functions, which fact was long since enunciated by the phrenologists, and though often disputed is now about to be established upon a scientific basis, students of this branch of enquiry will do well to watch the result of such experiments; although it does not seem quite clear how, by such experiments, it will be possible to ascertain what particular parts of the brain are connected with particular faculties of the mind; since these experiments are performed on persons only while under the influence of chloroform, in which state they are rendered incapable of manifesting any kind of mental exercise. The phenomena produced by Professor Ferrier's method being of a physical character, the limbs are made to move, but no thought or feeling expressed. The tongue, by the application of electricity, might be made to wriggle about in every possible direction, but this would in no way shew it to be the medium through which we become cognisant of flavours.

I should not have presumed thus to obtrude if my late friend Dr. Donovan had been living to vindicate the cause of phrenology in his more able manner.—I am, Sir, yours respectfully,

A. L. Vago, author of "Orthodox Phrenology."

RAILWAY COLLISIONS.

To the Editor of the Scientific and Literary Review.

Sir,—I beg to suggest the following plan for lessening the danger of railway collisions. I propose to have the locomotive and passenger carriages preceded by a number of trucks, connected with the locomotive and with one another by projections fixed to them, and by long poles fixed to the ends of these projections by a joint or hinge, these projections and poles being strong enough to push the trucks forward as the train advances, but not strong enough to resist the pressure of a collision. Suppose the first of these trucks to precede the locomotive by 200 yards or more, when a collision occurs the engineer reverses the engine, &c., or this is done by automatic machinery; the trucks and poles may be smashed, but before the locomotive and passenger carriages reach the obstruction, their velocity is so much arrested that the lives of the passengers are saved.

These trucks may be as useful in front as elsewhere; they may contain goods, cattle, &c. The necessary strength of the poles could be easily estimated; and the signal to the engineer or self-acting machinery easily arranged.

This plan would cause a little additional expense, and would slightly check the velocity of trains; but a little more expense, and a little less velocity, are surely more than counterbalanced by a little more safety.—I am, your obedient servant,

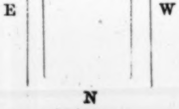
W. S. Carmichael.

Annandale-street, Edinburgh.

SMOKY CHIMNEYS.

To the Editor of the Scientific and Literary Review.

Sir,—I have had a communication with the Society of Arts on this subject, in which I mentioned the origin of my invention (I omitted to state, however, that about the year 1824, at a school in Charleston, South Carolina, we were all driven out by an irruption of smoke). About ten years ago my house in Wales became intolerable from the same cause, and I mentioned that during a ball, held at Denbigh, in the large room over the market, the company was visited by extensive puffs of smoke from time to time. I described the invention which has been already noticed in your pages. I am happy to say that public attention is being gradually drawn to the subject, but it seems easier to drive a tunnel through the Alps than to explain a very simple thing to our countrymen, and to get them to believe it. See p. 105, "Stephenson's Life." Locomotives in Newcastle, 1816—1829. It was decided to erect stationary engines on the Liverpool and Manchester line (p. 202). There is a well-known ragged industrial school here, one part is built in the form of a Greek π, or perhaps a more familiar object would be a pair of nut-crackers. There are two chimneys about the points *a a*; they are surrounded on three sides by buildings. These chimneys naturally smoked more particularly with a north wind, but since the adoption of my apparatus they have been entirely free from that annoyance whichever way the wind blows. These two chimneys have been experimented upon by many learned people in Cheshire, all of whom entirely failed. The result of my plan is so satisfactory that several other chimneys in the same building have been provided with the same apparatus, and one of my neighbours, who is altering his house, has put one upon every chimney.



I am, Sir, your obedient servant,

C. Butler Clough.

Chester, 20th Oct., 1873.

Sir Samuel W. Baker is to give an account of the countries he has recently visited in the Upper Nile region, at a meeting of the Royal Geographical Society on Monday evening the 3rd November. On this occasion the ordinary meeting of the society, which would have been the 10th of the month, is changed, to suit Sir Samuel's other engagements.

In a paper "On Nepaul Aconite, and on the Characteristics of the Aconitines," communicated to the Pharmaceutical Conference, Mr. T. B. Groves described the several alkaloids obtained from the aconites. He believes that there are two series of allied alkaloids—the one furnished by *Aconitum Napellus*, and the other by *A. ferox*, or some other Indian species. Each of these kinds of aconite seems to yield three distinct products, distinguished as crystallized aconitine, amorphous aconitine, and napellin.

Dr. Kenngott, of Zurich, has lately studied with the aid of the microscope, some specimens of obsidian, or volcanic grass, from Iceland. One of the specimens exhibited numerous enclosures in the form of small brown hollow bodies, of globular and cylindrical shape, regularly arranged in definite series.

FRANCIS' IMPROVED CONVERTIBLE SCHOOL DESK.

THE standards of these desks are made completely in wrought iron, welded and bolted or secured together. A bar of extra strength is inserted in the upright portion of the back, to give greater strength and to form a knuckle to which a movable top is hinged. The movable top is furnished with plates or brackets formed in L iron, with ratchet and tongue worked from the solid, and not welded on. Plates are secured to the top by four strong iron screws, and to the standards by a bolt running through the said knuckle. A longitudinal slot is provided at the end of a tongue The bolt has a head at one end, and is secured at the other by means of a slit pin with ends turned round the bolt. By means of the longitudinal slot at the end of the tongue, the movable top can be moved to any angle and secured in desired position by means of teeth worked in the ratchet which catch in the upper portion of the standard. The seat is secured to each standard by No. 2 flat, round-headed bolts and nuts. To make the desk and seat more rigid and free from rocking, stays are fixed to the under side of the seat and secured to standard by bolt and nut, and to seat by bolt and nut, and strong iron screw.

The advantages gained by the above construction comprise amongst others, extreme lightness, and simplicity in arranging the apparatus for use, either as desk seat with back, or as table.

HOUGH'S SHIP'S LIFE-BOATS.

BY this invention it is intended so to construct ship's life-boats as to be easily launched, without loss of time, so as not to be liable to be capsized either by the sea alone, or on contact with the ship's side.

The two ends of the boat are constructed separately from the body or centre portion. The ends are (preferentially) made of conical form, and have closed air and watertight chambers; though such chambers may be filled, or otherwise rendered buoyant, if thought desirable. On these ends floatation of the boat mainly depends; and they also serve as wheels on which the boat runs as it is launched into the water. The two ends are connected by an axle or axles, and support the body of the boat therefrom. In other respects the body of the boat is usually constructed like that of an ordinary life-boat.

The inventor prefers to have the side seats and double bottom of the body watertight, to give stability when too much weight is placed on one side, and to add to the buoyancy; and also to place pipes in the bottom, to allow the water to pass through as it may come over. Boats thus constructed are not liable to be overturned by contact with the side of a ship; for such contact merely rotates the ends of the boat, without tending to capsize the body or centre compartment. In case of the boat being under any circumstances capsized it is self-righting.

EXHIBITION OF APPLIANCES FOR THE ECONOMICAL CONSUMPTION OF FUEL AT MANCHESTER.

THE council of the Society for the Promotion of Scientific Industry, under the auspices of which body the above exhibition is to take place, having taken into consideration the enormous waste there is in the consumption of coal, whilst its cost is every day increasing, have resolved that an exhibition shall be held in Manchester of all appliances and apparatus that tend to the economic use and saving of fuel, for the purpose of inducing attention to, and eliciting opinions of practical men on the matter, and of giving all consumers of coal an opportunity of comparing the various appliances, with a view to their adoption of that which will best serve their purposes. The exhibition will comprise:—1st. Appliances which may be adapted to existing furnaces, &c., whereby an actual saving is effected in the consumption of fuel. 2nd. Appliances which may be adapted to existing furnaces, &c., whereby waste heat is utilised. 3rd. New steam generators and furnaces, boilers, and engines specially adapted for the saving of fuel and appliances, whereby waste products are utilised, and the radiation of heat prevented, &c., &c. The exhibition will include appliances used for manufacturing, agricultural, and domestic purposes. Either the apparatus itself, or diagrams, or models may be exhibited, and no limit is placed upon the class of article to be exhibited. Exhibitors will be required to deliver their exhibits free of charge at the place of exhibition, and to remove them at the close of the exhibition. They must also erect them if necessary at their own expense. Every exhibit must be accompanied by a full description, which must include a statement of the particular work the apparatus is intended to perform. A duplicate of this statement must be handed in when application is made to exhibit. Exhibitors will be given every opportunity of explaining the speciality of their apparatus. All articles are exhibited at the risk of the exhibitor, though every reasonable care will be exercised. Further information may be obtained from the secretary of the Society.—By order, William George Larkins, Secretary.

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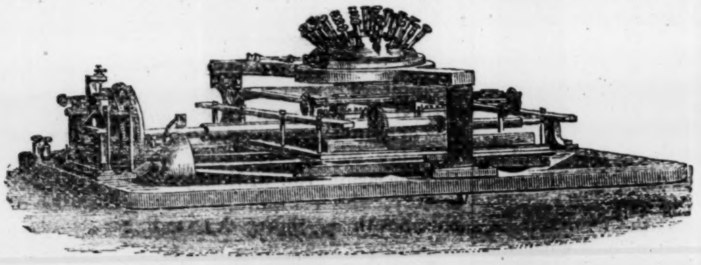

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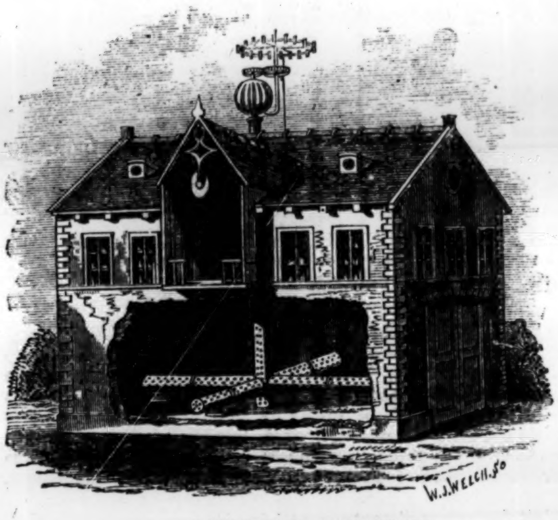

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